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FORM PTO-1390 REV. 5-93	US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEYS DOCKET NUMBER P00,0365
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S.APPLICATION NO. (if known, see 37 CFR 1.5) 09/486908
INTERNATIONAL APPLICATION NO. PCT/DE99/02009	INTERNATIONAL FILING DATE 01 JULY 1999	PRIORITY DATE CLAIMED 03 JULY 1998

TITLE OF INVENTION

"DATA STORAGE DEVICE"

APPLICANT(S) FOR DO/EO/US

STEFAN PFAB

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2)) - drawings attached.
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2) - drawings attached.

7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.

8. ☒ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).

10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report)**.

12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included. **(SEE ATTACHED ENVELOPE)**

13. ☒ Amendment "A" Prior to Action.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☐ A substitute specification.

15. ☐ A change of power of attorney and/or address letter.

16. ☒ Other items or information:
    a. ☒ Submission of Informal Drawings - 2 sheets of drawings, Figures 1 & 2.

    b. ☒ EXPRESS MAIL #EL 470809189US dated March 3, 2000.

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U.S. APPLICATION NO (if known, see 37 C.F.R. 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/486908	PCT/DE99/02009	P00,0365

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5):		
Search Report has been prepared by the EPO or JPO $840.00		
International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) . . $670.00		
No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) $760.00		
Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO $970.00		
International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) . . . . . $ 96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 840.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).	$	

Claims	Number Filed		Number Extra	Rate		
Total Claims	15	- 20 =	0	X $ 18.00	$	
Independent Claims	02	- 3 =	0	X $ 78.00	$	
Multiple Dependent Claims				$260.00 +	$	
				TOTAL OF ABOVE CALCULATIONS =	$ 840.00	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)					$	
				SUBTOTAL =	$ 840.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+	$	
				TOTAL NATIONAL FEE =	$ 840.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property				+		
				TOTAL FEES ENCLOSED =	$ 840.00	
				Amount to be refunded	$	
				charged	$	

a. ☒ A check in the amount of $ 840.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-2290. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Hill & Simpson
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85th Floor Sears Tower
Chicago, Illinois 60606

Steven H. Noll
SIGNATURE

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Registration Number

09/486908
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BOX PCT
IN THE UNITED STATES DESIGNATED/ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY--CHAPTER I

APPLICANT:	STEFAN PFAB
ATTORNEY DOCKET NO.:	P00,0365
INTERNATIONAL APPLICATION NO:	PCT/DE99/02009
INTERNATIONAL FILING DATE:	01 JULY 1999
INVENTION:	"DATA STORAGE DEVICE"

Assistant Commissioner for Patents,
Washington D.C. 20231

AMENDMENT "A" PRIOR TO ACTION

Sir:

Applicants herewith amend the above-referenced PCT application, and request entry of the Amendment prior to examination on the United States Examination Phase.

IN THE SPECIFICATION:

On page 1:

cancel lines 1-2 and substitute the following

--SPECIFICATION

TITLE

"DATA STORAGE DEVICE"

BACKGROUND OF THE INVENTION

Field of the Invention-- therefor;

in lines 3-4, cancel "a device according to the preamble of patent claim 1, i.e.";

above line 7, insert

Description of the Related Art--;

cancel line 8 and substitute --exhibit is that stored data can be read out as-- therefor;

in lines 9-10, cancel "in a matter of" and substitute --relates to-- therefor;

in line 11, cancel "microcontroller or the like" and substitute --or a microcontroller-- therefor;

in line 13, after ")", insert --,--;

in line 14, cancel "therein" and substitute --in them-- therefor;

in line 15, cancel ",";

in line 16, cancel "it" and substitute --faster access-- therefor;

in line 17, cancel "that" and substitute --because-- therefor;

cancel line 20 and substitute --This permits program sections having a linear-- therefor;

in line 21, cancel "skips) can" and substitute --branching) to--, and cancel "very fast. This however" and substitute --quickly. However-- therefor;

in line 22, cancel "does not apply - or only" and substitute --this-- therefor, and cancel the second "-";

in line 23, cancel "such as, for example" and substitute --that interrupt the linear execution, such as-- therefor;

in lines 23-24, cancel "and the like that interrupt the linear execution";

in line 25, cancel "for which reason the" and substitute --requiring-- therefor;

cancel lines 26-27 and substitute --slow program memory accesses, as though no cache existed.-- therefor; and

in line 28, cancel "Added thereto as a" and substitute --A further-- therefor.

On page 2:

in line 3, cancel "onto" and substitute --of-- therefor;

cancel line 6 and substitute --This is problematic because approximately-- therefor;

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above line 8, insert --SUMMARY OF THE INVENTION--;

in line 10, cancel "speeded" and substitute --sped-- therefor;

cancel lines 11-12 and substitute --This object is inventively achieved by a data storage device where the selectable output start addresses have small spacing differences from one another such that the amount of data that can be stored between neighboring output start addresses is smaller than the amount of data output in response to a data output request.--

in line13, cancel "It is provided in the accord therewith" and substitute --The invention provides-- therefor;

cancel line 14 and substitute --addresses within the data storage device exhibit such slight spacings (address distances/proximity) from one another that the data set-- therefor;

cancel lines 17-18 and substitute --Due to the small address differences between the selectable output start addresses, an output start address generally-- therefor;

in line 19, cancel "consideration -";

in line 22, cancel "As a result thereof, the" and substitute --The resulting-- therefor;

in line 24 cancel "astonishing" and substitute --extremely-- therefor;

in line 25, cancel "thereby ensue" and substitute --thus take place--;

in line 26, before "referred", insert --(--, and cancel "adaption data" and substitute --"adaption data")-- therefor;

in line 28, cancel "and with which a determination is made" and substitute --. This data is used to make a determination-- therefor;

in line 29, before "and", insert --(--, and after "extent", insert --)--;

in line 31, before "output", insert --the--; and

in line 32, cancel "thereof" and substitute --of this-- therefor.

On page 3:

in line 1, before "dynamic", insert --a--, and cancel "given" and substitute

--for-- therefor;

cancel lines 3-4 and substitute

-- Advantageous developments can be derived in a storage device where the output start address is determined using address data applied to the storage device, and further where this address also utilizes adaption data that is related to the output start address to be employed and an address defined by the address data. The storage device can also comprise output terminals and an interface provided between memory cells of the data storage device and the output terminals where the adaption data are used to control this interface. The interface may comprise a multiplexer that is driven based on the adaption data. This device can be used to through-connect data in the storage device with a first output start address or a second output start address. The first output start address may be an address represented by the address data applied to the storage device, and the second output start address can be related to the first output start address by a scope defined by the wiring of the multiplexer.-- therefor;

above line 7, insert --BRIEF DESCRIPTION OF THE DRAWINGS --;

in line 7, before "the schematic", insert --is a schematic diagram showing--;

in line 9, before "the schematic", insert --is a schematic diagram showing--;

above line 11, insert --DESCRIPTION OF THE PREFERRED EMBODIMENTS--;

in line 12, after "circuit,", insert --e.g.,--;

in line 13, cancel "or the like employed" and substitute --used-- therefor;

in line 14, cancel "to be more precise";

cancel line 15 and substitute --encompass other constructions as well.-- therefor;

in line 17, cancel "designed for respectively storing" and substitute --each designed to store-- therefor;

in line 18, cancel "matrix-like" and substitute --(matrix-like)-- therefor;

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in line 19, cancel "thereby proves" and substitute --is-- therefor, and before "in", substitute --,--;

in lien 20, after "time", insert --,--;

in line 21, cancel "example under consideration" and substitute --present example-- therefor;

in line 22, cancel "; of course, arbitrarily" and substitute --, but more or less could be used.-- therefor;

cancel line 23;

in line 24, cancel "Upon readout of" and substitute --When--, and after "device", insert --are read--;

in lines 25-26, cancel "example under consideration" and substitute -- present example-- therefor;

in line 26, cancel "; of course," and substitute --, but-- therefor;

in line 29, cancel "an adaption data" and substitute --, and adaption data is-- therefor;

in line 30, cancel "memory cell from" and substitute --location of the memory cell at-- therefor;

in line 31, after "writing", insert --to--; and

in line 32, cancel "beginning" and substitute --the beginning location of the memory cell-- therefor.

On page 4:

in line 1, cancel ". The" and substitute --. The output start address is defined as the-- therefor;

in line 2, cancel "data stored therein" and substitute --stored data-- therefor;

in lines 3-4, cancel "is referred to below as output start address";

in line 5, cancel "comments are limited" and substitute --relates solely-- therefor;

in line 10, cancel "thereby";

in lines 10-11, cancel "slight spacings" and substitute --small spacing differences-- therefor;

in line 12, cancel "then" and substitute --than-- therefor;

in line 15, cancel ". i.e.," and substitute --; i.e., -- therefor;

in line 17, cancel "whereby" and substitute --where-- therefor;

in line 18, cancel "plurality" and substitute --number-- therefor, and before "case", insert --present--;

in line 19, cancel "under consideration, wherein" and substitute --in which-- therefor;

in line 20, cancel "numbers" and substitute --numbered-- therefor;

in line 24, after "extent", insert --,--;

in line 25, cancel "employed" and substitute --used-- therefor, and cancel "then" and substitute --than-- therefor;

in line 26, cancel "i.e.," and substitute --I.e.,-- therefor;

in line 28, cancel "employed as" and substitute -- used as an-- therefor;

in line 29, cancel "that" and substitute --a corresponding modification of-- therefor;

in lines 30-31, cancel "is correspondingly modified. Said interface has hitherto" and substitute --This interface has formerly been-- therefor; and

in line 32, cancel ",".

On page 5:

in line 6, cancel "whereby x represents" and substitute --where x represents a number-- therefor;

in line 7, cancel "and amounts to" and substitute --(-- therefor, and cancel example under" and substitute -- present example--;

in lines 8, cancel "consideration, and whereby" and substitute --) and where-- therefor, and cancel "plurality" and substitute --number-- therefor;

in line 9, cancel "and amounts to" and substitute --(--;

in lines 9-10, cancel "example under consideration" and substitute --

present example)-- therefor;

in line 12, cancel "thereof";

in line 19, cancel "whereby" and substitute --where-- therefor;

cancel lines 26-30 and substitute the following

-- Figure 1 illustrates the selected memory cell field row SZFZ, the memory cells of it SZ00, SZ01, SZ02, etc, the multiplexer MUX, and the control signal that controls the multiplexer C, where the control signal C-- therefor; and

cancel line 32 and substitute --on it-- therefor.

On page 6:

in line 2, cancel "hitherto" and substitute --formerly-- therefor;

in line 11, cancel "then" and substitute --than-- therefor;

in line 18, cancel ", that" and substitute --one that-- therefor;

in line 19, before "can", insert --,--;

in line 21, cancel ", for example" and substitute --could be-- therefor;

in line 24, after "i.e.", insert --,--;

in line 25, cancel "ensue onto" and substitute --take place into-- therefor; and

in line 32, cancel "example under consideration" and substitute --present example-- therefor.

On page 7:

in line 9, cancel " "only" " and substitute --only-- therefor;

in line 11, cancel "example under consideration" and substitute --present example-- therefor;

in line 14, cancel "thereupon" and substitute --after this-- therefor;

in lines 14-15, cancel "example under consideration" and substitute --present example-- therefor;

in line 18, cancel "Which offset is optimum" and substitute --The optimum offset-- therefor;

in line 22, cancel ",";

in line 23, cancel "dependent" and substitute --depending-- therefor, and cancel "respectively" and substitute --respective-- therefor;

in line 26, cancel "to be"; and

cancel line 31 and substitute --It is compulsory-- therefor.

On page 8:

in line 4, cancel "given" and substitute --for-- therefor;

in line 6, cancel "Let it also be pointed out that" and substitute -- Furthermore-- therefor;

in line 7, cancel "can occur" and substitute --is possible-- therefor;

in line 8, cancel "Handling this particular characteristic" and substitute -- This situation-- therfor;

in line 9, cancel ". The" and substitute --, because the-- therefor;

cancel line 12 and substitute --In instances where the data-- therefor;

in line 14, before "are", insert --i.e.,--; and

below line 19, insert

-- The above-described data storage device is illustrative of the principles of the present invention. Numerous modifications and adaptions thereof will be readily apparent to those skilled in this art without departing from the spirit and scope of the present invention.--.

Cancel page 9.

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IN THE CLAIMS:

On page 10:

line 1, replace "**PATENT CLAIMS**" with --WHAT IS CLAIMED IS:--;

Please amend claims 1-7 as follows:

1. (Amended) A data [Data] storage device, comprising: [that, in response to a data output request, outputs]

memory cells having stored data with selectable output addresses;

wherein said storage device responds to a data output request by outputting said stored data beginning with a selected output start address; [,]

wherein [characterized in that the] selectable output start addresses are spaced [exhibit such slight spacings] from one another such that an [the] amount of data that can be stored between neighboring output start addresses is smaller than an [the] amount of data output in response to said [a] data output request.

2. (Amended) A data [Data] storage device according to claim 1, wherein said selected [characterized in that the determination of the] output start address is determined utilizing [to be employed ensues taking] address data applied to said [the] data storage device [into consideration].

3. (Amended) A data [Data] storage device according to claim 2, wherein:

said selected [characterized in that the determination of the] output start address is determined by further utilizing [to be employed ensues given additional consideration of] adaptation data applied to said [the] data storage device and; [,]

said [whereby the] adaptation data is related both to said [defined whether and, as warranted, to what extent the] output start address to be employed and an [is higher or lower than the] address that is defined by said [the] address data.

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4. (Amended) A data [Data] storage device according to claim 3, further comprising:

output terminals; and

[characterized in that the adaptation data are employed for controlling] an interface provided between [the] memory cells of said [the] data storage device and said [the] output terminals [of the data storage device];

wherein said adaptation data are used to control said interface.

5. (Amended) A data [Data] storage device according to claim 4, wherein said [characterized in that the] interface comprises [contains] a multiplexer [(MUX)] that is driven [by the adaptation data or] based on the adaptation data [, and with which the data stored beginning with a first output start address or the data stored beginning with a second output start address are optionally through-connected].

6. (Amended) A data [Data] storage device according to claim 8 [5], wherein said [characterized in that the] first output start address is an [the] address that is represented by said [the] address data applied to said [the] data storage device.

7. (Amended) A data [Data] storage device according to claim 8 [5 or 6], wherein said [characterized in that the] second output start address is related to, but different from, said [greater or smaller than the] first output start address by a scope defined by a [the] wiring of the multiplexer [(MUX)].

Please add the following claims 8-15

8. A data storage device according to claim 4, wherein data stored with an output start address selected from the group consisting of a first output start address and a second output start address are through-connected.

9. A method for outputting data from a data storage device, comprising the steps of:

receiving a data output request by said data storage device; and

outputting stored data in a quantity of data that is greater than a quantity of data that can be stored between neighboring output start addresses, and beginning said outputting of stored data with a selected output start address which is one of said output start addresses.

10. The method according to claim 9, further comprises the steps of:

applying address data to said data storage device; and

determining said selected output start address by utilizing said address data.

11. The method according to claim 10, further comprising the step of:

defining adaption data as an indicia related to said address data and said output start address;

applying said adaption data to said data storage device, wherein said step of determining said selected output start address utilizes said adaption data.

12. The method according to claim 11, further comprising the step of:

controlling, with said adaption data, an interface provided between memory cells of said data storage device and output terminals of said data storage device.

13. The method according to claim 12, further comprising the steps of:

controlling a multiplexer contained within said interface by applying said adaption data; and

through-connecting, via said multiplexer, data stored within said data storage device beginning with an address selected from the group consisting of a first output start address and a second output start address.

14. The method according to claim 13, further comprising the step of calculating said first output start address from said address data applied to said data storage device.

15. The method according to claim 13, further comprising the step of wiring said multiplexer so that said second output start address is related to, but different from, said first output start address by a scope defined by said wiring.

IN THE ABSTRACT

On page 12:

cancel line 2;

in lines 8-9, cancel ". As a result thereof, the plurality" and substitute --, thus minimizing the number-- therefor;

in lines 9-10, cancel "can be reduced to a minimum"; and

cancel line 11.

REMARKS

The present Amendment revises the specification and claims to conform to United States patent practice, before examination of the present PCT application in the United States National Examination Phase. All of the changes are editorial and applicant believes no new matter is added thereby. The amendment of claims 1-7 and the addition of claims 8-15 is not intended to be a surrender of any of the subject matter of those claims.

Early examination on the merits is respectfully requested.

Submitted by,

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SPECIFICATION

DATA STORAGE DEVICE

The present invention is directed to a device according to the preamble of patent claim 1, i.e. a data storage device that, in response to a data output request, outputs stored data from a selected output start address.

One of the most important properties that a data storage device must exhibit is comprised therein that data stored therein can be read out as quickly as possible. This is particularly true when the data storage device in a matter of a program memory for a program-controlled unit such as, for example, a microprocessor, microcontroller or the like. The data storage devices, which are usually employed as program memories (ROMs, EPROMs, Flash EPROMs, DRAMs, etc.) are usually not in the position to output the (command) data stored therein as fast as modern program-controlled units can process them. Fast, static RAMs are therefore often employed as buffer memories (Caches). These Caches make it possible that the program-controlled unit does not always have to retrieve the required data from the slow program memory but can often obtain them from the fast Cache.

As a result thereof, in particular, program sections having a linear execution (exhibiting no skips) can be implemented very fast. This, however, does not apply - or only applies in limited fashion - to program sections having commands such as, for example, branch commands and the like that interrupt the linear execution. In many instances, the command to be executed after a branch is not available in the Cache, for which reason the slow program memory must continue to be accessed in these cases as previously.

Added thereto as a complicating factor is that the command that is to be retrieved from the program memory after a branch or the like is often not completely contained in the data that are output by the program memory in response to a data output request. This can even be the case when the data

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set that is output in response to a data output request is relatively large (substantially greater than the command length) with, for example, 4 or 8 bytes. In such cases, two read accesses onto the program memory are required in order to be able to obtain the data representing the next command.

This is a not inconsiderable problem, particularly since approximately every third command in typical programs is a branch instruction.

The present invention is therefore based on the object of finding a measure with which the offering of data that represent successor commands after branches or the like can be speeded up.

This object is inventively achieved by the features claimed in the characterizing part of patent claim 1.

It is provided in the accord therewith that the selectable output start addresses exhibits such slight spacings from one another that the data set that can be stored between neighboring output start addresses is smaller than the data set output in response to a data output request.

Due to the slight mutual spacings of the selectable output start addresses, an output start address - leaving a few exceptions out of consideration - can always be applied with which the data representing a command can be read out from the program memory (the data storage device) on the basis of a single access.

As a result thereof, the time that is required in order to offer data representing successor commands after branches or the like can be reduced to a minimum in an astonishingly simple way.

The suitable selection of the output start address can thereby ensue, for example, upon employment of data referred to below as adaptation data that are applied to the data storage device in addition to the data that are otherwise standard and with which a determination is made as to whether and, potentially, to what extent the output start address to be employed is greater or smaller than the address that is defined by the address data likewise applied to the data storage device as output start address. As a result thereof, the output start address can be individually determined in

dynamic fashion in an extremely simple way and given unmodified retention of the standard addressing of the data storage device.

Advantageous developments of the invention can be derived from the subclaims, the following description and from the Figures.

The invention is explained in greater detail below on the basis of exemplary embodiments with reference to the Figures. Shown are:

Figure 1 the schematic structure of a first exemplary embodiment of the described data storage device; and

Figure 2 the schematic structure of second exemplary embodiment of the described data storage device.

The data storage devices described in greater detail below are semiconductor memories accommodated in an integrated circuit, RAMs, ROMs, EPROMs, flash-EPROMs or the like employed as program memories to be more precise; however, the data storage devices can also fundamentally be a matter of other, arbitrary data storage devices.

The data storage devices comprise a plurality of memory cells (designed for respectively storing one data bit) that are interconnected in a known way matrix-like to form a memory cell field comprising a plurality of rows and columns. It thereby proves especially advantageous in view of the access time when the individual memory cell field rows comprise a great number of memory cells. In the example under consideration, the memory cell field rows respectively contain 256 memory cells; of course, arbitrarily more or fewer memory cells can also be provided per memory cell field row.

Upon readout of data stored in the data storage device, a data word respectively comprising a predetermined data set is output. In the example under consideration, a data word covers 64 bits; of course, a data word can also comprise more or fewer bits.

The memory cells can be addressed via address data applied to the data storage device an adaptation data likewise applied to the data storage device. The addressing determines the memory cell from which data are written into the memory cell when writing the data storage device or, respectively, beginning with which memory cell data stored in the data

storage device are output when reading the data storage device. The address of the memory cell beginning with which data stored therein are output when reading the data storage device is referred to below as output start address.

The following comments are limited to the readout of data from the data storage device. The readout of data from the data storage device is initiated by a data output request. In response to a data output request, 64 data bits (a 64-bit data word) are output from the output start address defined by the address data and the adaptation data.

The selectable output start addresses thereby exhibit such slight spacings from one another that the data set that can be stored between neighboring output start addresses is smaller then the data set output in response to a data output request.

The data storage device is addressed in the standard way by the address data applied to the data storage device. i.e., the output start addresses definable by the address data follow one another in steps that remain of constant size, whereby the step width corresponds exactly to the plurality of bits output in response to a data output request. In the case under consideration, wherein the data can be written and read in units of 64 bits, this means that the addresses of the bits numbers 0, 64, 128 and 192 of each and every memory cell field row can be defined as output start addresses via the address data.

The adaptation data applied to the data storage device defines whether and, potentially, to what extent the output start address to be employed is greater or smaller then the output start address defined by the address data. i.e., a definition can be made as to whether the output start address defined by the address data or an address that is more or less greater or smaller is employed as output start address.

This can be accomplished, for example, in that the interface between the memory cell field and the output terminals of the data storage device is correspondingly modified. Said interface has hitherto composed of one or more multiplexers, with which the bits

0 through x-1

x through 2x-1

..., or

(n-1) x through nx-1

of the respectively selected memory cell field row are optionally through-connected onto the output terminals, whereby x represents equal to the plurality of bits per output data word and amounts to 64 in the example under consideration, and whereby n represents the plurality of data words storable per memory cell field row and amounts to 4 in the example under consideration.

What is achieved by one or more additional multiplexers and/or a modification of the existing multiplexers and (additional) drive thereof by the adaptation data is that the bits

0 through x-1 or y through x-1+y

x through 2x-1 or x+y through 2x-1+y

...., or

(n-1) x through nx-1 or (n-1) x+y through nx-1

of the respectively selected memory field row are optionally through-connected onto the output terminals, whereby the new parameter y references an offset relative to the output start address defined by the address data.

The practical realization of an arrangement with which the bits 0 through 63 or the bits 16 through 79 of a memory cell field row are optionally through-connected onto the output terminals of the data storage device (offset y = 16) is illustrated in Figure 1.

The selected memory cell field row is thereby referenced with reference character SZFZ, the memory cells thereof are referenced with the reference characters SZ00, SZ01, SZ02,..., the multiplexer is referenced with the reference character MUX and the control signal that controls the latter is referenced with the reference character C, whereby the control signal C driving the multiplexer MUX corresponds to the adaptation data or is based thereon.

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When the control signal C of the multiplexer MUX has the value 0, then, as was hitherto standard, the data stored in the memory cells SZ00 through SZ63 are through-connected onto the output terminals A00 through A63 of the data storage device; when, in contrast, the control signal C of the multiplexer MUX has the value 1, then the data stored in the memory cells SZ16 through SZ79 are through-connected onto the output terminals A00 through A63 of the data storage device.

In both instances, 64 data bits are output from the data storage device in response to a data output request. However, the origin of the data that are output differs because the output start address in the case of C = 1 is greater by the offset (16 in this case) then the output start address in the case C = 0.

The displaceability of the output start address as needed proves advantageous particularly when, due to the appertaining data output request, the command following a branch instruction or the like is to be read, and the data representing this command begin at a location that lies relatively far behind the data word normally output (without shifting the output start address). A command, namely, that could only be partially retrieved via a normal data output request can then be completely retrieved with a single access onto the data storage device.

This, for example, is the case when the memory cells SZ55 through SZ71 represent the first command B1 that is to be implemented following a branch or the like.

If one wished to retrieve the command B1 "normally", i.e. without shifting the output start address, two accesses would have to ensue onto the data storage device because only the first byte of the (2-byte) command B1 could be obtained by the first access. When, in contrast, the command B1 is retrieved with an output start address shifted by at least one byte, then the command B1 can be completely retrieved with a single access onto the data storage device.

The extent to which the output start address is shifted by the adaptation data is determined in the example under consideration by the

wiring of the multiplexer MUX and can be arbitrarily determined in terms of operational sign and amount.

The practical realization of an arrangement with which the bits 0 through 63 or the bits 32 through 95 of a memory cell field row are optionally through-connected onto the output terminals of the data storage device (offset y = 32) is shown in Figure 2.

The structure of the arrangement according to Figure 2 essentially corresponds to the structure of the arrangement according to Figure 1; differences exist "only" in the wiring of the input terminals of the multiplexer MUX.

In the example under consideration, the shift of the output start address by 32 bits proves even more advantageous because the command B1 following the branch instruction and, further, the command B2 following thereupon and stored in memory cells SZ72 through SZ88 in the example under consideration can be completely obtained by a single access onto the data storage device.

This, however, does not mean that an offset of 32 is generally more advantageous than other offsets. Which offset is optimum particularly depends on the amount of data that is output per data output request and on the lengths of the commands to be carried out.

The data storage device can also be constructed such that the offset employed can be varied in terms of operational sign and/or amount, so that the offset can be individually selected dependent on the respectively current conditions (upon employment of adaptation data covering a plurality of bits).

When the offset, as in the exemplary embodiment illustrated in Figure 2, is to be exactly half the size of the plurality of data bits output in response to a data output request, the adaptation data (respectively covering one bit in the examples illustrated in Figures 1 and 2) can be replaced by an additional (address) bit in the address data applied to the data storage device.

For the sake of completeness, let it be mentioned that it is compulsory for the proper functioning of the arrangements according to Figures 1 and 2

that more memory cells than there are data bits to be output must be read out when reading data out from the data storage device. Since, however, all memory cells of the selected memory cell field row are already usually read out given known data storage devices, no modifications or - at most - no more significant modifications of the data storage devices are required.

Let it also be pointed out that, when reading data stored at the start and/or at the end of a memory cell field row, it can occur that only a part of the data that are output is valid. Handling this particular characteristic, however, does not represent a problem. The fact that the data that are output are only partly valid can, for example, be signaled by a corresponding identifier (flag).

It should also be obvious that, in instances wherein the data representing a command proceed beyond the end of a memory cell field row (are continued in the next memory cell field row), two accesses onto the data storage device must still be carried out in order to completely retrieve the appertaining command.

Nonetheless, the plurality of accesses required in order to read specific data out can be reduced to a minimum by a data storage device constructed in the way described or similar thereto.

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LIST OF REFERENCE CHARACTERS

SZFZ	Memory cell field row
SZxx	Memory cell xx within a memory cell field row
B1	First command that is to be carried out after a branch
B2	Second command that is to be carried out after a branch
MUX	Multiplexer
C	Multiplexer control signal (= adaptation data)
Ayy	Output terminal yy of the data storage device

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PATENT CLAIMS

1. Data storage device that, in response to a data output request, outputs stored data beginning with a selected output start address, characterized in that the selectable output start addresses exhibit such slight spacings from one another that the amount of data that can be stored between neighboring output start addresses is smaller than the amount of data output in response to a data output request.

2. Data storage device according to claim 1, characterized in that the determination of the output start address to be employed ensues taking address data applied to the data storage device into consideration.

3. Data storage device according to claim 2, characterized in that the determination of the output start address to be employed ensues given additional consideration of adaptation data applied to the data storage device, whereby the adaptation data defined whether and, as warranted, to what extent the output start address to be employed is higher or lower than the address that is defined by the address data.

4. Data storage device according to claim 3, characterized in that the adaptation data are employed for controlling an interface provided between the memory cells of the data storage device and the output terminals of the data storage device.

5. Data storage device according to claim 4, characterized in that the interface contains a multiplexer (MUX) that is driven by the adaptation data or based on the adaptation data, and with which the data stored beginning with a first output start address or the data stored beginning with a second output start address are optionally through-connected.

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6. Data storage device according to claim 5, characterized in that the first output start address is the address that is represented by the address data applied to the data storage device.

7. Data storage device according to claim 5 or 6, characterized in that the second output start address is greater or smaller than the first output start address by a scope defined by the wiring of the multiplexer (MUX).

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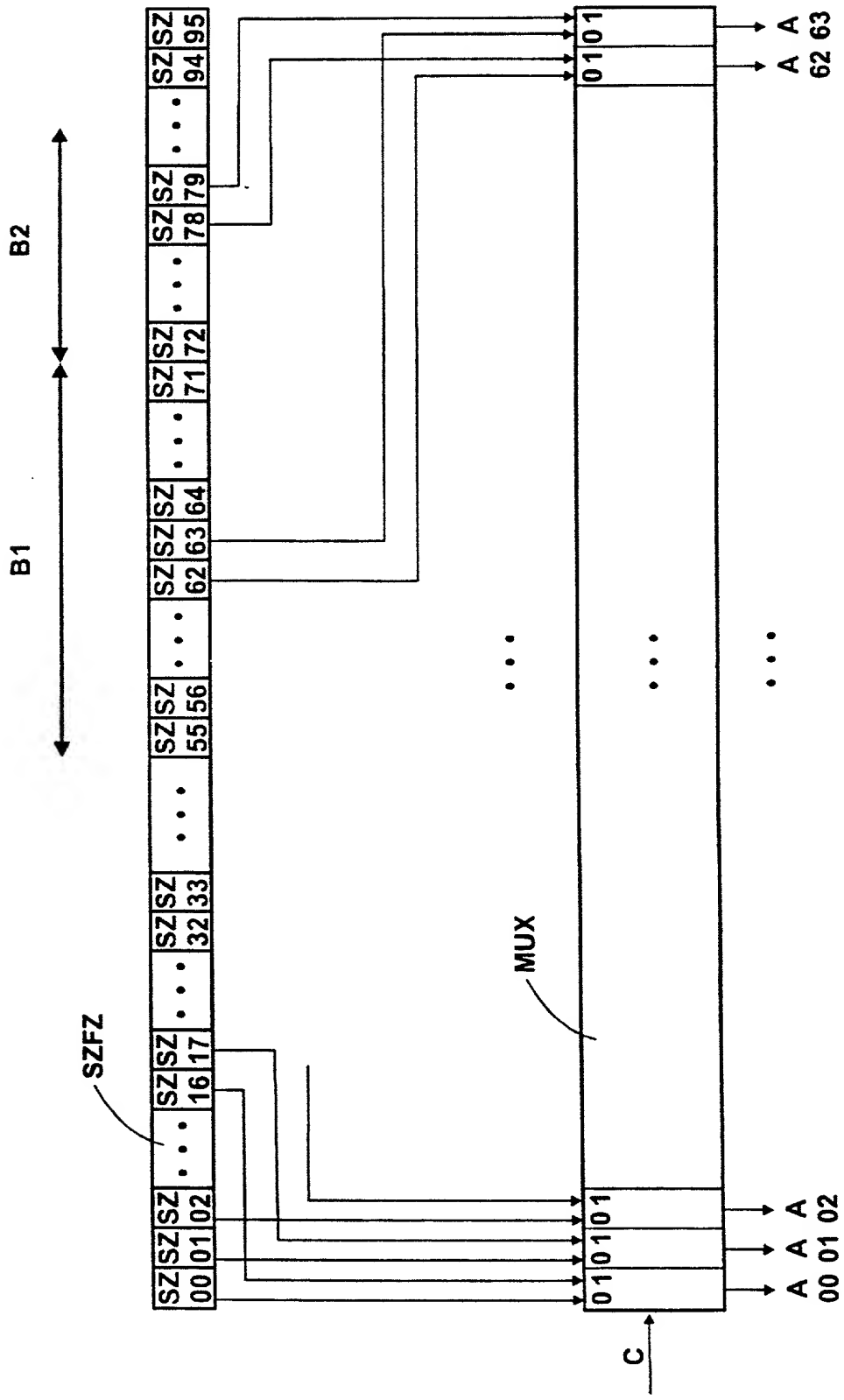
ABSTRACT

Data Storage Device

A data storage device is disclosed that, in response to a data output request, outputs stored data beginning with a selected output start address. The disclosed data storage device is characterized in that the selectable output start addresses exhibit such slight spacings from one another that the amount of data storable between neighboring output start addresses is smaller than the amount of data output in response to a data output request. As a result thereof, the plurality of accesses onto the data storage device can be reduced to a minimum.

Figure 1

Docket No. 2000P05400US


B2
B1
SZFZ
MUX
C
SZ 00
SZ 01
SZ 02
SZ 16
SZ 17
SZ 32
SZ 33
SZ 55
SZ 56
SZ 62
SZ 63
SZ 64
SZ 71
SZ 72
SZ 78
SZ 79
SZ 94
SZ 95
0 1 0 1
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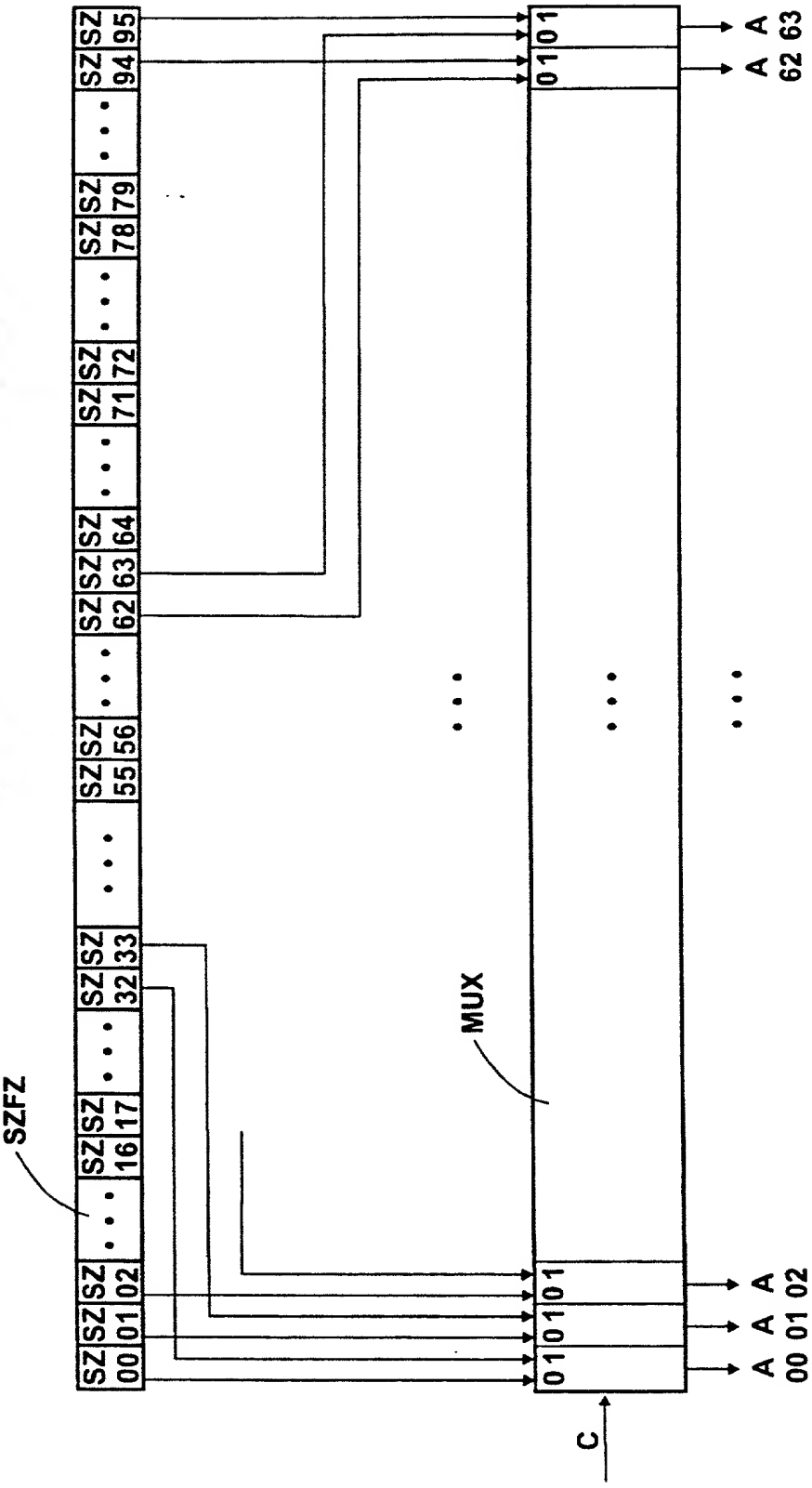
00 01 02
A A
62 63

FIG 1


B2
B1
SZFZ
MUX
C
SZ 00
SZ 01
SZ 02
SZ 16
SZ 17
SZ 32
SZ 33
SZ 55
SZ 56
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SZ 63
SZ 64
SZ 71
SZ 72
SZ 78
SZ 79
SZ 94
SZ 95
0 1 0 1 0 1
A A A
00 01 02
0 1 0 1
A A
62 63

FIG 2

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514 Rec'd PCT/PTO 03 MAR 2000

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UNDER THE PATENT COOPERATION TREATY--CHAPTER I

APPLICANT:	STEFAN PFAB
ATTORNEY DOCKET NO.:	P00,0365
INTERNATIONAL APPLICATION NO:	PCT/DE99/02009
INTERNATIONAL FILING DATE:	01 JULY 1999
INVENTION:	"DATA STORAGE DEVICE"

Assistant Commissioner for Patents,

Washington D.C. 20231

SUBMISSION OF INFORMAL DRAWINGS

Sir:

Applicant herewith submits 2 sheets (Figures 1, 2) of informal drawings for the above-referenced PCT application.

Submitted by,

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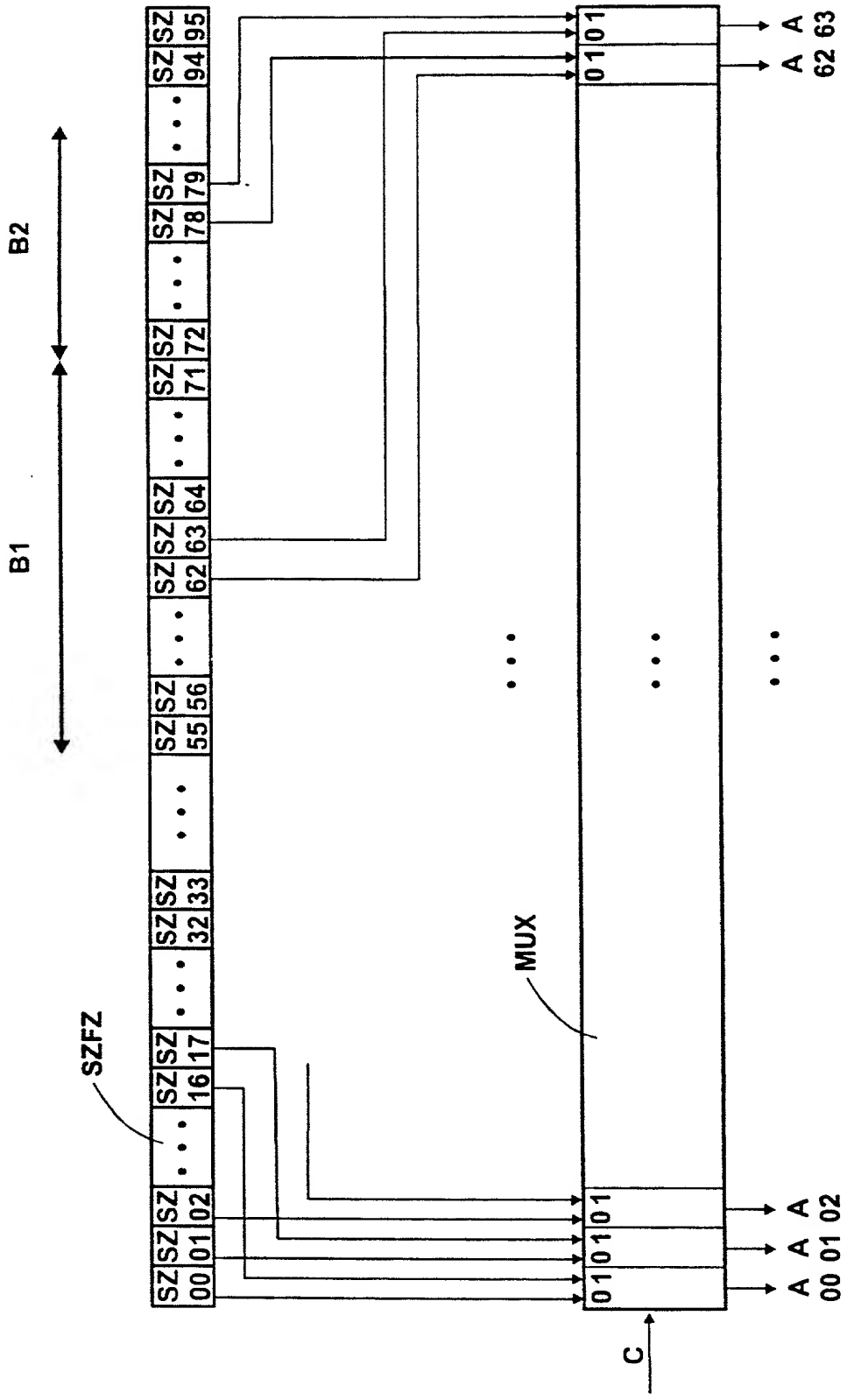
B2
B1
SZFZ
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SZ 16
SZ 17
SZ 32
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SZ 62
SZ 63
SZ 64
SZ 71
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SZ 78
SZ 79
SZ 94
SZ 95
0 1 0 1 0 1
A A A
00 01 02
0 1 0 1
A A
62 63

FIG 1

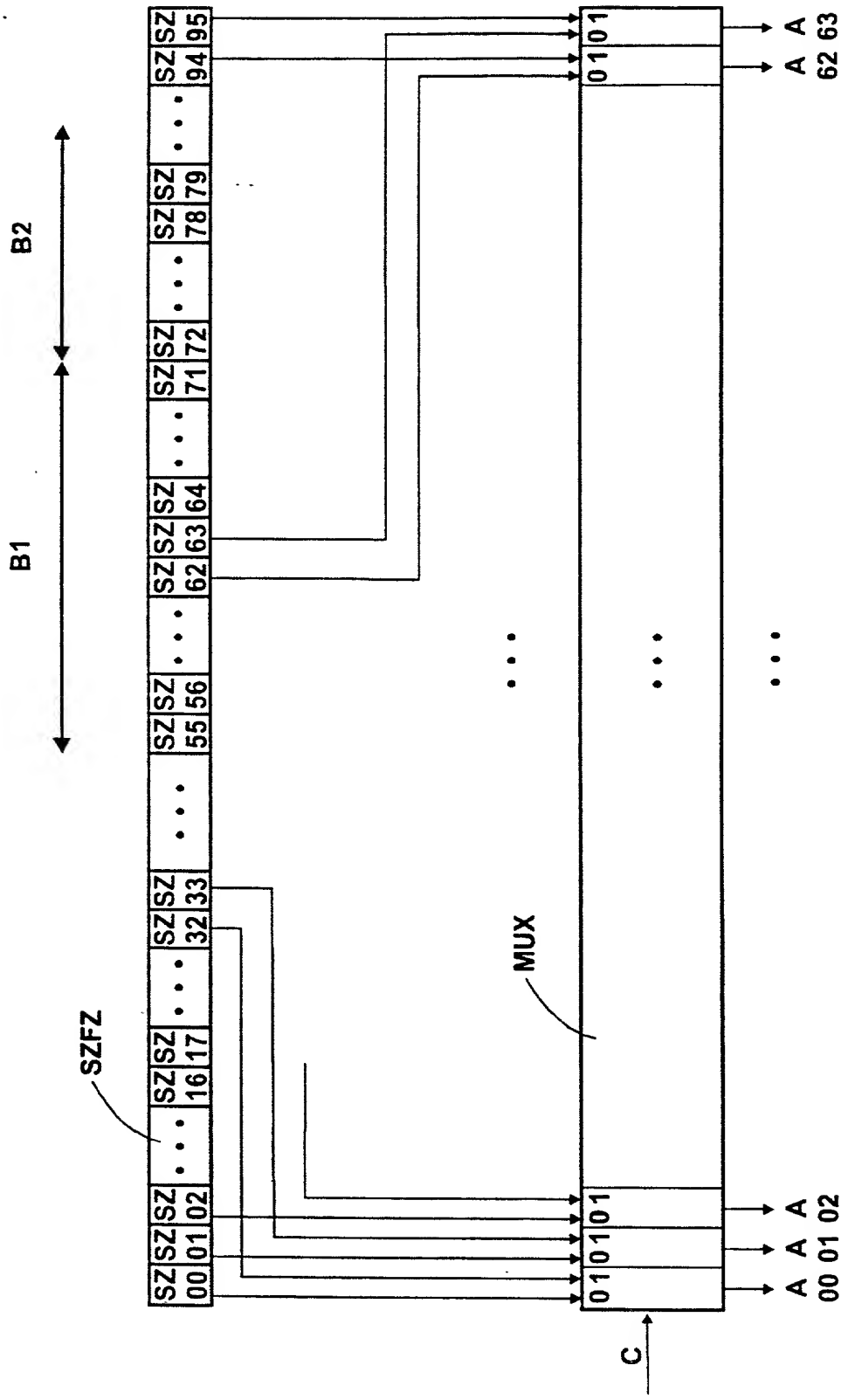
B2
B1
SZFZ
MUX
C
SZ 00 SZ 01 SZ 02 ... SZ 16 SZ 17 ... SZ 32 SZ 33 ... SZ 55 SZ 56 ... SZ 62 SZ 63 SZ 64 ... SZ 71 SZ 72 ... SZ 78 SZ 79 ... SZ 94 SZ 95
0 1 0 1 0 1
A A A 00 01 02
A A 62 63

FIG 2

#3

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
ERKLÄRUNG FÜR PATENTANMELDUNGEN MIT VOLLMACHT
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

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☐ am _____ als
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PCT Anmeldungsnummer _____
eingereicht wurde und am _____
abgeändert wurde.

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Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56 von Wichtigkeit sind, an.

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As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

the specification of which

(check one)

☐ is attached hereto

☐ was filed on _____ as
PCT international application
PCT Application No. _____
and was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign applications
Priorität beansprucht

			Priority Claimed	
198 29 836.6	**Germany**	**03 Juli 1998**	☒	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein

Ich beanspruche hiermit germäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56 meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35, United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122 I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

17

And I hereby appoint Messrs. John D. Simpson (Registration No. 19,842), Dennis A. Gross (24,410), Robert M. Barrett (30,142), Steven H. Noll (28,982), Kevin W. Guynn (29,927), Robert M. Ward (26,517), Brett A. Valiquet (27,841), Edward A. Lehman (22,312), David R. Metzger (32,919), Todd S. Parkhurst (26,494), James D. Hobart (24,149), Melvin A. Robinson (31,870), Joseph P. Reagen ((35,332), Michael R. Hull (35,902), Michael S. Leonard (37,557), William E. Vaughan (39,056) and Lewis T. Steadman (17,074), all members of the firm of Hill & Simpson, A Professional Corporation

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Unterschrift des Erfinders Datum 24.3.00	Inventor's signature Date
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Staatsangehörigkeit Bundesrepublik Deutschland	Citizenship
Postanschrift Wettersteinstr. 2	Post Office Address
82049 Grosshesselohe Bundesrepublik Deutschland	

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Unterschrift des Erfinders Datum	Inventor's signature Date
Wohnsitz	Residence
Staatsangehörigkeit	Citizenship
Postanschrift	Post Office Address

(Bitte entsprechende Informationen und Unterschriften im Falle von weiteren Miterfindern angeben).

(Supply similar information and signature for subsequent joint inventors).